then $n =$ - ____ JL*_L44 x i»ooo,ooo
3600 x 5 X π x 0-65 x 0-65 X 62
= 389 tubes per pass.
Total number of tubes = 3 x 389
= 1167,

12 X

1167 X 7T X 075 I
= 77 ft. per pass. j

The condensation per square foot of tube surface per hour

$$= \frac{20,000}{1760}$$
= 1 1 -4 Ib. nearly.

Referring to steam tables, the vacuum would be 30 — 2-24 = 2776 in. of mercury when the barometer stands at 30 in.

If the outlet water temperature t_2 = 100° F., with all other conditions the same, a similar calculation shows that

W = 792,000 Ib. per hour,
t_m = 13-6° F.,
S == 2330 sq. ft.,
n = 308 tubes per pass,
or total tubes = 3 X 308 = 924.
/ = 12-9 ft. per pass,
and steam condensed per square foot per hour $= \frac{20,000}{2330} = 8\text{-}6$ Ib. per hour.

A comparison of the results in these two examples indicates how the necessary cooling surface and length of tubes increases the nearer the outlet-water temperature t_2 is made to approach the steam-inlet temperature T_s.

Any deposit of oil or dirt on the tube surfaces increases the resistance to heat transmission, and tends to reduce the vacuum. With steam turbines very little or no oil should find its way into the turbine casing, and therefore there is not much likelihood of oil being deposited on the condenser tubes by the steam. In reciprocating engines, however, oil is used in the cylinder for the lubrication of the valves and piston, and some of this oil is deposited on the tube surfaces, even though an oil separator may be used between the engine and the condenser.

The water used for circulation is sometimes very dirty, and then deposits mud or dirt on the inside of the tubes, again causing a reduction of the heat transmission. Speaking generally, however, the higher the velocity of the water through the tubes the less is this deposit likely to

grow. In both cases it is necessary to clean through the condenser periodically in order to preserve a good vacuum in the condenser.